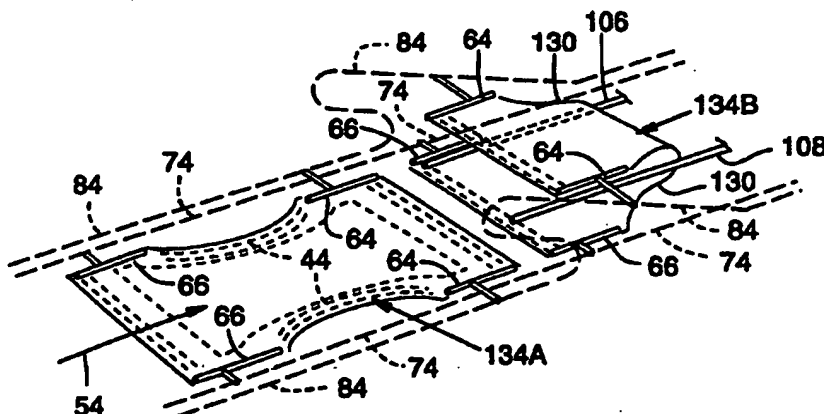


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(54) Title: APPARATUS AND METHOD FOR PRODUCING ELASTICIZED PRODUCTS



## (57) Abstract

Apparatus and method for producing a disposable absorbent garment from flexible material having elasticized portions tending to contract the product (40) as it moves along a path (54). The apparatus (10) includes a plurality of spaced apart engaging members (64, 66) which grip opposed edge and end margins of the product (40) and a conveyor (74, 84) on which the engaging members are mounted to carry the engaging member (64, 66) and products (40) stretched therebetween along a production path (54). At various stations along the production path apparatus is provided for retarding forward movement of one of the sets of engaging members (98) to fold a leading edge portion thereof back into a position overlying a trailing end portion thereof, joining apparatus (120) for sealing side edge margins together, and severing mechanism (124) for severing the article from the engaging members (64, 66). A holding rod (106, 108) extends longitudinally and is received within the garment as it is folded over to hold it in a laterally stretched condition after it is released from the engaging members (64, 66). A tucking member (110, 112) downstream from the severing mechanisms is operable to tuck in side edge margins to produce a properly folded garment (134E) ready for packaging.

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**APPARATUS AND METHOD FOR PRODUCING  
ELASTICIZED PRODUCTS**

**BACKGROUND AND SUMMARY OF THE INVENTION**

This invention relates to apparatus and method  
5 for producing products composed of flexible sheet  
material having elastic portions tending to contract the  
product during manufacture, and more particularly to  
apparatus and method which maintains the sheet material  
in stretched condition during assembly and produces  
10 appropriate folding, sealing, tucking and other desired  
operations thereon.

**SUMMARY OF THE INVENTION**

In the production of products manufactured of  
flexible sheet material, such as in the manufacture of  
15 disposable absorbent garments, it is often difficult to  
control the orientation of the flexible sheet material  
as it moves through the manufacturing process. In many  
instances, it is necessary to maintain the sheet  
material substantially planar while various operations  
20 are exercised upon it.

This difficulty in maintaining control of the  
sheet material becomes even more pronounced when elastic  
members are a part of the product. For example, in the  
production of disposable absorbent garments such as  
25 diapers or training pants, elastic members are secured  
to the sheets extending transversely thereof to provide  
fitted waistbands, and longitudinally extending elastic  
elements are attached to provide form-fitting leg cuffs  
in the garment.

30 In the past it has been difficult to maintain  
such products in a stretched substantially planar  
orientation as the products are carried along a path  
during the manufacturing operation due to the tendency  
of the elastics to contract the product. Further,  
35 problems have existed in holding the sheet material and  
product in proper orientation during operations to  
produce needed folding, joining, trimming with movement

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of the product along a conveying path to produce a finished product.

A general object of the present invention is to provide novel apparatus and method for maintaining  
5 longitudinally and laterally stretched conditions for such products as they are moved along a path during manufacture.

More specifically, an object is to provide engaging members which hold opposed end and side regions  
10 of a product in a defined stretched condition and carry the product along a desired manufacturing path during operation.

A further object is to provide novel apparatus and method in which such a product may be folded over  
15 about a central region thereof whereby a leading portion may be laid over a trailing portion to define a folded over product as desired.

Yet another object is to provide novel apparatus which provides continued holding of marginal edge  
20 portions of such a product while it is folded over and then joins portions thereof to provide a substantially continuous waistband portion for a garment, which then is severed from the engaging and holding mechanism.

A further object of the present invention is to  
25 provide novel apparatus and method for producing inwardly defined tucks in selected regions of a product produced in accordance with the invention prior to final packaging.

These and other objects and advantages will  
30 become more fully apparent as the following description is read in conjunction with the drawings.

#### DRAWINGS

FIG. 1 is a schematic side elevation view of apparatus according to an embodiment of the present  
35 invention for producing articles, such as disposable absorbent garments including training pants;

FIG. 2 is an enlarged perspective view of a portion of the apparatus and an exemplary illustration

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of a portion of the method for forming products in the apparatus of FIG. 1;

FIG. 3 is an extension of the assembly apparatus and process following that illustrated in FIG. 2;

5        FIG. 4 is an extension of the assembly apparatus and process following that illustrated in FIG. 3;

FIG. 5 is a schematic side elevation view of a portion of conveyor mechanism operable to carry product through the assembly apparatus;

10       FIG. 6 is an enlarged side elevation view of a portion of the conveyor mechanism illustrated in FIG. 5;

FIG. 7 is an enlarged cross-sectional view taken generally along the lines 7-7 in FIG. 5;

15       FIG. 8 is an enlarged perspective view of a portion of the conveyor and product engaging members in the apparatus with two engaging members being substantially co-extensive, and spaced apart longitudinally of the apparatus;

20       FIG. 9 is a view similar to FIG. 8, but with one of the engaging members inverted and overlying the other engaging member;

FIG. 10 is a top plan view of the conveyors and engaging members holding a work piece therebetween when positioned as illustrated in FIG. 9;

25       FIG. 11 is a view taken generally along the line 11-11 in FIG. 10;

30       FIGS. 12, 13, 14, 15, 16 and 17 are schematic illustrations taken generally along the lines 12-12, 13-13, 14-14, 15-15, 16-16, and 17-17 in FIGS. 2, 3, and 4, respectively.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT  
OF THE INVENTION

Referring first to FIG. 1 at 10 is indicated generally apparatus constructed according to an  
35       embodiment of the invention. The apparatus is illustrated specifically in use to produce disposable diapers or training pants, but it should be understood that it is not limited to such products.

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As is known, disposable diapers and training pants generally include an outer, or backing, sheet of a liquid impervious material, onto which an absorbent pad is placed. A liquid pervious liner, or inner, sheet is placed thereon to encase the absorbent pad therebetween. One such garment and method of manufacture is illustrated in U.S. Patent No. 4,726,807 to Young and Lancaster, which is herein incorporated by reference to illustrate typical material used and known methods of manufacturing such garments.

In the manufacture of such products it often is desirable to provide strands, or bands, of elastic material extending transversely of the inner and outer sheets to produce elasticized waist areas for the garment and longitudinally extending elastic to form leg cuffs. Such products often are manufactured on assembly lines in which the garment material moves substantially continuously longitudinally, in what is referred to as the "machine direction". The elastic tends to cause the sheet material to contract both laterally and longitudinally which produces difficulties in the manufacturing process.

An elongate sheet, or web, of flexible liquid-impervious backsheet material 12 is carried from a roll 14 upwardly along a path denoted at 20 and onto a conveyor 18. As it is carried upwardly laterally extending elongate waist elastic elements are applied thereto by a waist elastic applicator indicated schematically at 22. Apparatus for applying waist elastic are known in the art and thus will not be described in detail here.

An elongate absorbent pad 26 is carried by a conveyor 28 and deposited on backsheet 12. A plurality of elongate leg elastic elements are applied to the backsheet in desired curvilinear pattern extending substantially longitudinally of the backsheet by a leg elastic applicator indicated schematically at 32. Leg elastic applicators also are known in the art and thus

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will not be described in detail here. An elongate web, or sheet, of liquid-pervious material to form an inner liner, or top sheet 34 is drawn from a roll 36 and deposited on pad 26 and backsheet 12 to encase the absorbent pad therebetween.

For example, the liquid impervious backsheet 12 may be a thin thermoplastic material, such as a pigmented polyethylene film having a thickness in the range of 0.02-0.04 mm. The liquid pervious liner sheet 16 may be a carded polyester fiber with a latex binder or a spun-bonded polypropylene having continuous fibers and thermally bonded by patterned calendar rolls. The liner sheet may be impregnated with a surfactant to render it hydrophilic. The moisture absorbent layer, or pad, 26 may be of wood fibers or other fibers, such as chemical wood pulp, or any other suitable liquid absorbing material such as commercially available fluff pulp or a fluffed bleached craft soft wood pulp.

These elements are secured together by adhesive or heat bonding to define an elongate composite product indicated generally at 40 in FIG. 2. The composite has a backsheet 12 and topsheet 34 encasing a pad 26 therebetween. In FIG. 2 transversely extending waist elastics are indicated generally in dashed line at 42 and leg elastics extending in curvilinear patterns, but generally longitudinally thereof are indicated as dashed lines at 44. A pair of spaced, laterally extending dashed lines 48, 50 define separation regions between discrete products to be formed in the manufacturing process from the elongate composite thus far described.

Apparatus and methods for forming a composite as thus far described is generally known in the art.

Since the composite thus formed includes laterally and longitudinally extending elastic elements 42, 44 it has a tendency to contract both laterally and longitudinally. The apparatus of the present invention is operable to hold the flexible elasticized materials

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in a substantially stretched and planar condition for handling in the operations to be described below.

Referring still to FIG. 1, various operational stations are indicated only schematically. As the  
5 composite product 40 is carried longitudinally along a path indicated generally at 54, in what is termed the machine direction, spaced side margin regions thereof are incut to form what will become leg portions for the garment. These cuts are made by water jets indicated  
10 generally at 56. Discrete products will be separated from the composite at separation lines, such as those indicated generally at 48, 50, by a final knife section noted at 58. The discrete products then will be carried through what is referred to as a fold, seal and trim  
15 region indicated generally at 62.

Referring to FIGS. 2, 3, and 4, the apparatus in the fold, seal and trim unit is illustrated generally in perspective view. FIG. 3 is a longitudinal extension of the end of FIG. 2, and FIG. 4 is a longitudinal  
20 extension of the end of FIG. 3. In actuality, no break would occur between the elements shown in FIGS. 2, 3, and 4 and they would form a common direct extension, one of the other.

Referring to FIG. 2, a pair of laterally spaced  
25 first engaging, or gripping, members 64 are positioned to grip, or hold, opposed side edge margins, or portions of what will be referred to herein as a leading end portion, or region, of a garment, or product, adjacent separation line 48. A pair of second engaging, or  
30 gripping, members 66, which also are spaced laterally of the path of the garment, are positioned to engage, or grip, what is referred to herein as a trailing end portion of a product, or garment, adjacent separation line 50. These engaging members, as will be described  
35 in greater detail below, are operable to grip, or hold, opposite end portions and opposite side portions of the product and maintain the product stretched both longitudinally and laterally against the contracting



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tendencies of elastics 42, 44, thus to hold the product in substantially planar condition as it is carried longitudinally along path 54 in the apparatus.

Referring to FIGS. 8 and 12, it will be seen  
5 that engaging members 64, 66 include elongate bars 64a, 66a which have pins or teeth, 64b, 66b projecting upwardly therefrom. The teeth are angled somewhat laterally outwardly from the center of the conveyor path. An elongate connecting rod 68 is secured to and  
10 extends perpendicularly from the center of bar 64a, and a connecting rod 70 is secured to and extends substantially perpendicularly outwardly from rod 66a in a region offset from the center of rod 66a. A substantially rigid connector block 72 connects engaging  
15 member 66 to an elongate endless conveyor chain 74. Connecting rod 68 is rotatably connected through a pivot connection 78 to a downwardly depending leg 80a of an angle bracket 80. The opposite end of bracket 80 is secured to and movable with an elongate endless conveyor  
20 chain 84.

In FIGS. 7 and 12 an engaging member 66 is illustrated positioned with an edge margin portion of composite product 40 impaled on pins 66 for carrying the flexible sheet materials in substantially planar  
25 condition along the path of the apparatus. Engaging members 64 similarly hold side, or edge, margin portions of the composite product 40.

FIGS. 9-11 illustrate engaging members 64, 66 positioned as they will lie upon folding over a product  
30 in the assembly process. This will be described in greater detail below.

Referring to FIG. 5, the general paths for conveyor chains 74, 84 are illustrated. The apparatus includes conveyor chains 74, 84 at opposite sides of the  
35 product path as seen in FIGS. 2-4 and 10. Both conveyor chains 74, 84 at opposite sides of the apparatus are trained around sprockets positioned as generally indicated at 86, 88, and 90. As they travel along the

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upper portion of the conveyor run chain 74 maintains a substantially horizontal run from sprocket 90 to sprocket 92. It then makes a reverse bend around sprocket 94 and then back to a sprocket positioned as  
5 generally noted at 86.

Chain 84, on the other hand, travels from sprocket 90, about sprocket 96, upwardly and rearwardly about sprocket 98, and then inclines downwardly and forwardly along the conveyor path under sprocket 100 to  
10 then make a turn downwardly at sprocket 102. The reverse curvatures of the conveyor paths for chains 74 and 84 is such that they will maintain their desired spacing and action as they move along the upper reach of the conveyor apparatus as will be described below.

Referring again to FIGS. 3 and 4, a pair of laterally spaced, longitudinally extending, horizontal elongate holding rods, or elements, 106, 108 are mounted to extend into the region between the elevations of sprockets 98 and 100 and are spaced laterally inwardly  
15 toward the center of the product path from engaging members 64, 66. Mounting and support structure for holding elements 106, 108 is omitted for clarity in the drawings.

Adjacent the downstream ends of rods 106, 108  
25 they are bifurcated into horizontally disposed, vertically spaced elongate, upper and lower legs 106a, 106b and 108a, 108b, respectively

A pair of substantially horizontally disposed, inwardly angled elongate tucking rods 110, 112, are  
30 supported adjacent and extend inwardly through the space between legs 106a, 106b (for rod 110) and between legs 108a, 108b (for rod 112).

Referring still to FIG. 4, mounted slightly upstream in the product path from the bifurcated  
35 portions of holding elements 106, 108, and spaced laterally outwardly from rods 106, 108 are sealing units 118, 120. The sealing units illustrated include elongate upper and lower heating elements 118a, 118b,

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120a, 120b, respectively, positioned above and below the path along which a product will be carried to seal side seams of a product, as will be described below.

Spaced immediately downstream from sealing units 118, 120 are severing knives 122, 124. These knives are positioned laterally outwardly from sealing units 118, 120 respectively, but laterally inwardly from the path of engaging members 64, 66.

Describing the operation of the apparatus thus far described, and referring first specifically to FIG. 1, an elongate web of flexible backsheet material 12 is drawn from roll 14, and is carried past waist elastic applicator 22 which applies waist elastic elements extending laterally of the backsheet as indicated generally at 42 in FIG. 2. A plurality of longitudinally spaced absorbent pads 26 are deposited upon backsheet 12 atop conveyor 18.

Elongate leg elastic elements, such as those indicated generally at 44 in FIG. 2 are applied substantially longitudinally to the backsheet 12. As is seen in FIG. 2, the leg elastics are disposed in a somewhat curvilinear path spaced inwardly from the outer side edges 40a, 40b of composite product 40.

An elongate web of flexible sheet material to form an inner liner 34 is drawn from roll 36 and is applied atop backsheet 12 overlying pad 26 to encase and enclose the pad and waist and leg elastics therein. The composite thus formed is carried in the direction of path 54 and over a roller indicated generally at 126 in FIG. 5.

A pair of silicone rollers, such as those indicated generally at 128, 130 in FIGS. 5 and 7 receive edge margin portions of the composite product 40 therebetween and guide the material over the pins 64b, 66b of the engaging members 64, 66 to drive the pins through edge margin portions of the backing and liner sheets. As is best seen in FIGS. 7 and 12, since the pins are angled laterally outwardly from the center of

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the path for the product, the natural tendency of the product to contract due to the elastic members therein will hold the product tightly on the pins of the engaging members.

5           Conveyor chains 74, 84 are driven by drive mechanism (not shown) at the selected speed for movement of the product through the apparatus. As is seen in FIG. 2, a first set of engaging members 64 engage  
10           opposed side edge margins of a portion of the composite product adjacent what will be considered a leading end edge of a product adjacent separation line 48. Engaging members 66 at opposite sides of the path hold opposite side edge margins of the material adjacent what is referred to herein as the trailing edge adjacent  
15           separation line 50. The conveyor chains and engaging members are sufficiently rigid and well supported that they will hold the materials in substantially stretched condition, resisting the contracting forces of the waist and leg elastic elements.

20           The composite 40 is carried into the region of the water jets 56 which includes a pair of water jets mounted on swing arms 56a, 56b, as is known. The arms and jets swing laterally inwardly and outwardly in preselected timed relation to form incut leg regions  
25           indicated generally at 130 at opposite side margins of the product. These incut leg regions are defined at opposite sides of each discrete product to be produced and are substantially centrally located longitudinally of the product.

30           The product then is carried further downstream to a final knife region 58 at which a rotary knife severs the product along separation lines 48, 50 to form a discrete product, or garment, 134A.

35           As the conveyor chains reach the region of sprockets 96 illustrated in FIGS. 5 and 6, conveyor chains 74 continues to move in a substantially horizontal path. Conveyor chains 84 at opposite sides of the path however, carrying engaging members 64, are

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carried upwardly along the curvilinear path winding around sprockets 96, 98, and thence downwardly under sprocket 100.

FIG. 6 illustrates sequential positions for an engaging member 64 as it moves with its associated conveyor chain 84 about the path provided by sprockets 96, 98, and 100. In FIG. 6, opposite ends of an engaging member 64 are designated A, B, respectively. With this designation it can be seen that the engaging members 64 holding the leading edge portions of a garment 134B are inverted, or turned over, as they pass around this series of sprockets. The pivot connections 78 between engaging members 64 and their conveyor chains 84 permit this turning to occur. It has been found that this inverting action occurs naturally due to the movement of the conveyor chains, engaging members and elasticity of the product being carried. It should be recognized however, that if the elasticity of the product is insufficient to cause inversion to occur, various forms of ancillary turning mechanism, such as cams, or engaging mechanism may be used to produce the necessary action.

As is seen in FIG. 3, engaging members 64 initially are positioned a substantial distance ahead of engaging members 66 for each product as they are moved along the product path. However, the movement of conveyor chains 84 about sprockets 96, 98, 100 significantly retards the movement of engaging members 64 relative to the movement of engaging members 66 in the direction of path 54, such that engaging members 64, and the leading end portion of the garment which they carry, come into overlying registry with engaging members 66 and the trailing end portion of the product carried by members 66.

This overlying relationship of engaging members 64, 66 to bring the leading and trailing portions of the garment into registry, is illustrated in FIGS. 4, 6, 10, and 11. Engaging members 64 closely overlies engaging

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members 66 and due to the angularity of their teeth 64b, 66b, they continue to hold side edge margins of the end portions of the garment in a laterally stretched condition.

5 Referring again to FIG. 3, it will be seen that the garment 134B is folded over by the operation just described about its mid-region or central crotch region, which is free of engagement by the engaging members 64, 64. The incut leg margin regions 130 move into the  
10 space between holding rods 106, 108. The trailing end portion of the garment moves under rods 106, 108 and the leading end portion is disposed atop the rods.

Moving to FIG. 4, as the engaging members again are brought into overlying relationship, the engaging  
15 members 64, 66 are positioned laterally outwardly from rods 106, 108. This positioning is illustrated schematically in FIG. 13. Engaging members 64, 66 carried by their associated conveyor chains 74, 84 carry folded-over product 134C through sealing units 118, 120  
20 respectively. Opposed portions of the product are contacted by heated elements 118a, 118b at one side of the product and by 120a, 120b at the opposite side of the products. What had been the leading and trailing end portions of garment 134C thus are heat sealed  
25 together at a seam region by sealing units 118, 120 as is known, and shown schematically in FIG. 14. It will be recognized that heat sealing units are used for illustrative purposes only and other methods for sealing side seams of the product may be used. This produces a  
30 garment having a continuous waist band area.

The garment 134C exiting sealing units 118, 120 is carried through severing knives 122, 124 as illustrated schematically in FIG. 14 which severs portions 134f, 134g from garment 134C, with portions  
35 134f, 134g becoming waste to be carried away therefrom by engaging members 64, 66. At this point, the garment is captured between an upper conveyor 140, and a lower conveyor 144, shown schematically only, which will

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continue to move the product to the end of the assembly process.

As a product 134D moves into the region of bifurcated legs 106a, 106b, and 108a, 108b, it is spread  
5 apart vertically to produce side regions 134h and 134i adjacent opposite sides of the garment spanning the spaces between the bifurcated legs.

The garment is moved along the path and engaged by tucking rods 110, 112 which fold in regions of sides  
10 134h, 134i between the bifurcated legs as illustrated in FIG. 16 and tuck the side regions into the configuration illustrated in FIG. 16. A finished garment is indicated generally at 134E in FIGS. 4 and 17 with an enclosing elasticized waistband 150, elasticized leg cuffs 130,  
15 and inwardly folded side edge margins ready to be inserted into a waiting package 152.

While a preferred embodiment of the invention has been described herein, it should be apparent to those skilled in the art that variations and  
20 modifications are possible without departing from the spirit of the invention.

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CLAIMS

1. Apparatus for producing a product of flexible material having elasticized portions tending to contract the product as it is moved along a path comprising,
  - 5 a plurality of spaced apart engaging members operable to engage and hold the product adjacent opposed end regions and opposed side, regions thereof and a conveyor operable to maintain selected spacing between said engaging members to maintain said product stretched both longitudinally and laterally of the
  - 10 product and to carry said engaging members along the path for the product at a selected speed for the product while maintaining said selected spacing therebetween.
2. The apparatus of claim 1, wherein the product comprises a flexible sheet and said engaging members comprise grippers operable to hold said sheet adjacent edge margins thereof.
3. The apparatus of claim 1, wherein said product comprises a flexible sheet and an engaging member comprises a pin operable to pierce and hold said sheet adjacent an edge margin of the sheet.
4. The apparatus of claim 1, wherein said plurality of engaging members comprises at least four members each positioned to engage the product adjacent an intersection between an end region and a side region thereof and said engaging members are spaced apart a
- 5 distance to maintain the product stretched longitudinally and laterally.
5. The apparatus of claim 4, wherein said conveyor comprises a pair of spaced elongate first conveyor elements disposed adjacent and extending along opposite side margins of the path for the product on
- 5 which conveyor elements engaging members are mounted and means for driving said conveyor elements in the direction of said path.
6. The apparatus of claim 5, wherein said first conveyor elements carry a first pair of opposed engaging



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members positioned to engage opposed side edge margins of the product adjacent a leading portion of the product as it is moved along said path, and which further comprises a second pair of conveyor elements disposed adjacent and extending along opposite side margins of the path which carry a second pair of opposed engaging members spaced longitudinally of the path from the first pair of engaging members, said second engaging members being positioned to engage opposed side edge margins of the product adjacent a trailing portion of the product as it is moved along the path.

7. The apparatus of claim 6, wherein said first pair of engaging members are pivotally mounted on said first conveyor elements and said apparatus further comprises turning mechanism operable to cause said first engaging members to pivot as they are moved along said path to fold a leading portion of the product over a trailing portion of the product.

8. The apparatus of claim 7, wherein said turning mechanism comprises mechanism operable to retard movement of said first conveyor element longitudinally of the path relative to said second conveyor element in the region of said turning mechanism to place the leading portion of the product in registry with said trailing portion of the product.

9. The apparatus of claim 8, which further comprises joining mechanism downstream in said path from said turning mechanism operable to join selected regions of said leading and trailing portions of the product.

10. The apparatus of claim 9, wherein said joining mechanism is positioned laterally inwardly of the path of said engaging members whereby said selected regions are joined inwardly of the engaging members and which further comprises severing mechanism downstream in said path from said joining mechanism operable to sever said product along lines intermediate said engaging members and said joined regions.

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11. The apparatus of claim 7, wherein the paths of said first and second conveyor elements diverge in the region of said turning mechanism, said first conveyor element is moved longitudinally of the path at a slower speed than said second conveyor element in the region of the turning mechanism to place the leading portion in registry with the trailing portion of the product with a folded over mid-region of the product therebetween free of engagement by an engaging member, and which further comprises an elongate holding element extending longitudinally of the path positioned intermediate said diverging conveyor elements in the turning region and laterally inwardly of said engaging elements to extend through a gap at the mid-region of the folded-over product.

12. The apparatus of claim 11, which further comprises joining mechanism downstream in said path from said turning mechanism operable to join together selected portions of said leading and trailing portions held by said engaging members in regions intermediate said engaging members and said holding element.

13. The apparatus of claim 12, which further comprises severing mechanism downstream in said path from said joining mechanism operable to sever said product along a line extending substantially longitudinally of said path intermediate said engaging members and said joined portion.

14. The apparatus of claim 13, wherein said holding element has a bifurcated portion including a pair of elongate substantially parallel spaced legs operable to engage an inner side of said joined region of said product and produce a spreading thereof with a portion of the product spanning the space between said legs, and which further comprises a tucking member positioned to engage and tuck a portion of said product spanning the space between said legs into a fold extending laterally inwardly of the path between said legs.

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15. The apparatus of claim 13, which further comprises an outfeed conveyor downstream from said severing mechanism operable to carry said engage and carry product along a continuation of said path.

16. Apparatus for producing a product including flexible material having elasticized portions tending to contract the product as it is moved along a path comprising,

- 5           a plurality of spaced apart engaging members operable to engage and hold the product adjacent opposed end regions and opposed side regions thereof, and
- a conveyor operable to maintain selected spacing between said engaging members to maintain said product
- 10 stretched both longitudinally and laterally of the product and to carry said engaging members along the path for the product at a selected speed for the product while maintaining said selected spacing therebetween, said conveyor comprising first and second pairs of
- 15 spaced elongate conveyor elements extending along opposite sides of the path, with a first pair of engaging members carried by said first conveyor elements to engage opposed edge margins of the product adjacent a leading portion thereof as it is carried along said path
- 20 and a second pair of engaging members carried by said second conveyor elements to engage opposed edge margins of the product adjacent a trailing portion thereof,
- cutting mechanism operable to produce incut portions along side edge margins of said product
- 25 intermediate said first and second engaging members,
- turning mechanism operable to cause said first engaging member to pivot as they are moved along said path to fold a leading portion of the product over a trailing portion thereof with a gap formed therebetween
- 30 in a mid-region of the product at the incut portions, and
- an elongate holding member extending longitudinally of the path positioned to extend through said gap and between said leading and trailing portions.

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17. The apparatus of claim 16, which further comprises joining mechanism downstream in said path from said turning mechanism operable to join selected regions of said leading and trailing portions held by said  
5 engaging members in regions intermediate said engaging members and said holding element.

18. The apparatus of claim 17, which further comprises severing mechanism downstream in said path from said joining mechanism operable to sever said product along a line extending substantially  
5 longitudinally of said path intermediate said engaging members and said joined portion.

19. The apparatus of claim 18, wherein said holding element has a bifurcated portion including a pair of elongate substantially parallel spaced legs operable to engage on inner side of said joined region  
5 of said product and produce spreading thereof with a portion of the product spanning the space between said legs, and which further comprises a tucking member positioned to engage and tuck a portion of said product spanning the space between said legs members into a fold  
10 extending laterally inwardly of the path between said legs.

20. Apparatus for producing an absorbent garment comprising

mechanism for joining together a first elongate web of flexible sheet material, a second elongate web of  
5 flexible sheet material, absorbent pad material interposed and encased between said first and second webs, and elastic material extending laterally and longitudinally of the sheet material to form an elongate composite, said composite having sections adapted to be  
10 separated therefrom to form discrete products each having opposed ends and opposed sides,

a plurality of spaced apart engaging members operable to engage and hold the composite adjacent portions thereof which define opposed end regions and  
15 opposed side region of a discrete product, and

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a conveyor operable to maintain selected spacing between said engaging members to maintain said product stretched both longitudinally and laterally of the product and to carry said engaging members along the path for the product at a selected speed for the product while maintaining said selected spacing therebetween.

21. The apparatus of claim 20, wherein said plurality of engaging members comprises at least four members each positioned to engage the product adjacent an intersection between an end region and a side region thereof and said engaging members are spaced apart a distance to maintain the product stretched longitudinally and laterally.

22. The apparatus of claim 21, wherein said conveyor comprises a pair of spaced elongate first conveyor elements disposed adjacent and extending along opposite side margins of the path for the product on which conveyor elements engaging members are mounted and means for driving said conveyor elements in the direction of said path.

23. The apparatus of claim 22, wherein said first conveyor elements carry a first pair of opposed engaging members positioned to engage opposed side edge margins of the product adjacent a leading portion of the product as it is moved along said path, and which further comprises a second pair of conveyor elements disposed adjacent and extending along opposite side margins of the path which carry a second pair of opposed engaging members spaced longitudinally of the path from the first pair of engaging members positioned to engage opposed side margins of the product adjacent a trailing portion of the product as it is moved along the path.

24. The apparatus of claim 23, which further comprises severing mechanism operable to sever a discrete product from the composite formed and said engaging members are positioned to engage the severed product adjacent opposed ends and sides thereof to maintain a stretched condition for the product against

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the urging of the elastic to contract the product as it is moved along the path.

25. The apparatus of claim 24, wherein said first pair of engaging members are pivotally mounted on said first conveyor elements and said apparatus further comprises turning mechanism operable to cause said first  
5 engaging members to pivot as they are moved along said path to fold a leading portion of the product over a trailing portion thereof.

26. The apparatus of claim 25, wherein said turning mechanism comprises mechanism operable to retard movement of said first conveyor element longitudinally of the path relative to said second conveyor element in  
5 the region of said turning mechanism to place the leading portion of the product in registry with said trailing portion of the product.

27. The apparatus of claim 26, which further comprises joining mechanism downstream in said path from said turning mechanism operable to join selected regions of said leading and trailing portions of the product.

28. The apparatus of claim 27, wherein said joining mechanism is positioned laterally inwardly of the path of said engaging members whereby said selected regions are joined inwardly of the engaging members and  
5 which further comprises severing mechanism downstream in said path from said joining mechanism operable to sever said product along lines intermediate said engaging members and said joined regions.

29. The apparatus of claim 23, wherein the paths of said first and second conveyor elements diverge in the region of said turning mechanism, said first conveyor element is moved longitudinally of the path at  
5 a slower speed than said second conveyor element in the region of the turning mechanism to place the leading portion in registry with the trailing portion of the product with a folded over mid-region of the product therebetween free of engagement by an engaging member,  
10 and which further comprises an elongate holding element

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extending longitudinally of the path positioned intermediate said diverging conveyor elements in the turning region and laterally inwardly of said engaging elements to extend through a gap at the mid-region of the folded-over product.

30. The apparatus of claim 29, which further comprises joining mechanism downstream in said path from said turning mechanism operable to join together selected portions of said leading and trailing portions held by said engaging members in regions intermediate said engaging members and said holding element.

31. The apparatus of claim 30, which further comprises severing mechanism downstream in said path from said joining mechanism operable to sever said product along a line extending substantially longitudinally of said path intermediate said engaging members and said joined portion.

32. The apparatus of claim 31, wherein said holding element has a bifurcated portion including a pair of elongate substantially parallel spaced legs operable to engage an inner side of said joined region of said product and produce spreading thereof with a portion of the product spanning the space between said legs, and which further comprises a tucking member positioned to engage and tuck a portion of said product spanning the space between said legs into a fold extending laterally inwardly of the path between said legs.

33. A method for producing an absorbent garment comprising the steps of

overlaying first and second elongate webs of flexible sheet material with absorbent pad material interposed and encased therebetween, and applying elastic material thereto extending laterally and longitudinally of selected portions thereof to form an elongate composite having sections adapted to be separated therefrom to form discrete products each having opposed end regions and opposed side regions,

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providing spaced apart engaging members carried by a conveyor,

engaging and holding the composite adjacent portions thereof which define opposed end regions and  
15 opposed side regions of a discrete product in the composite,

maintaining a selected spacing between the engaging members to maintain said product stretched both longitudinally and laterally of the product, and

20 moving the engaging members and products held thereby longitudinally along a path at a selected speed for the product while maintaining said selected spacing between the engaging members.

34. The method of claim 33, which further includes the step of producing incut side margin portions in said composite intermediate spaced engaging members.

35. The method of claim 33, which further includes the step of severing a discrete product from remainder portions of the composite while maintaining the discrete product stretched laterally and  
5 longitudinally while being moved along the path.

36. The method of claim 35 wherein an engaging member holding a leading end portion of the product as it moves along the path is mounted on a first conveyor, and an engaging member holding a trailing end portion of  
5 the product is mounted on a second conveyor, and which further comprises the steps of turning the first engaging member as it is moved along the path to fold a leading end portion of the product over a trailing end portion thereof.

37. The method of claim 36, wherein in the turning step the movement of the first engaging member longitudinally of the path is retarded relative to the second of engaging member to place the leading end  
5 portion of the product in registry with the trailing end portion of the product.



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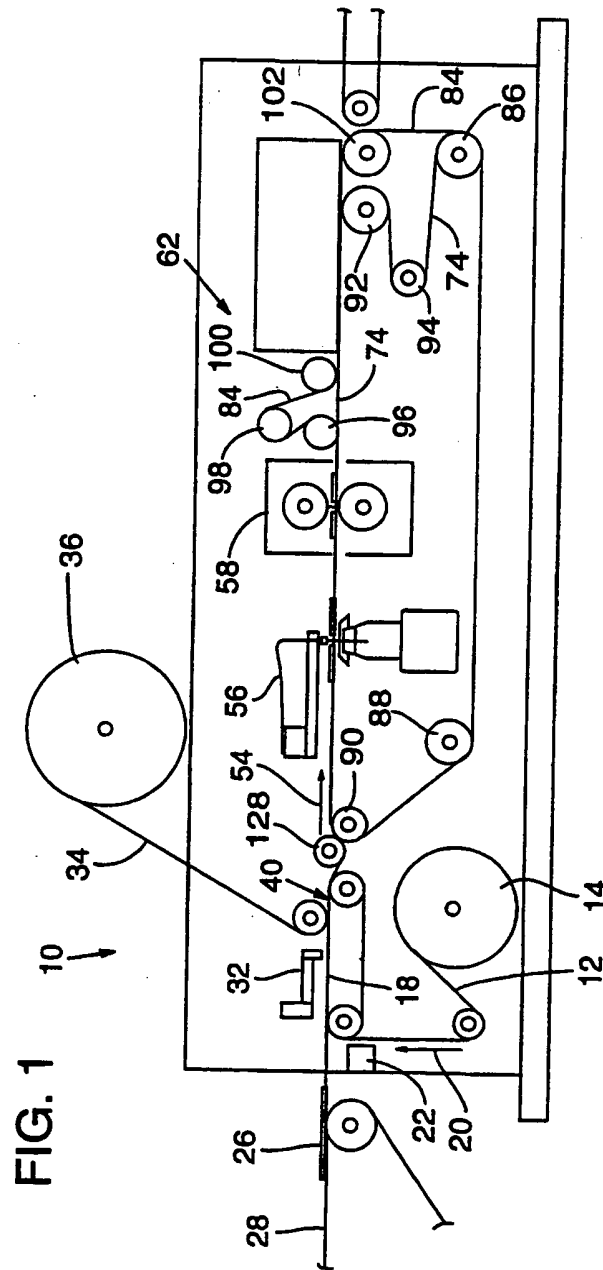
38. The method of claim 37, which further comprises the step of joining together edge margin regions of the leading and trailing end portions.

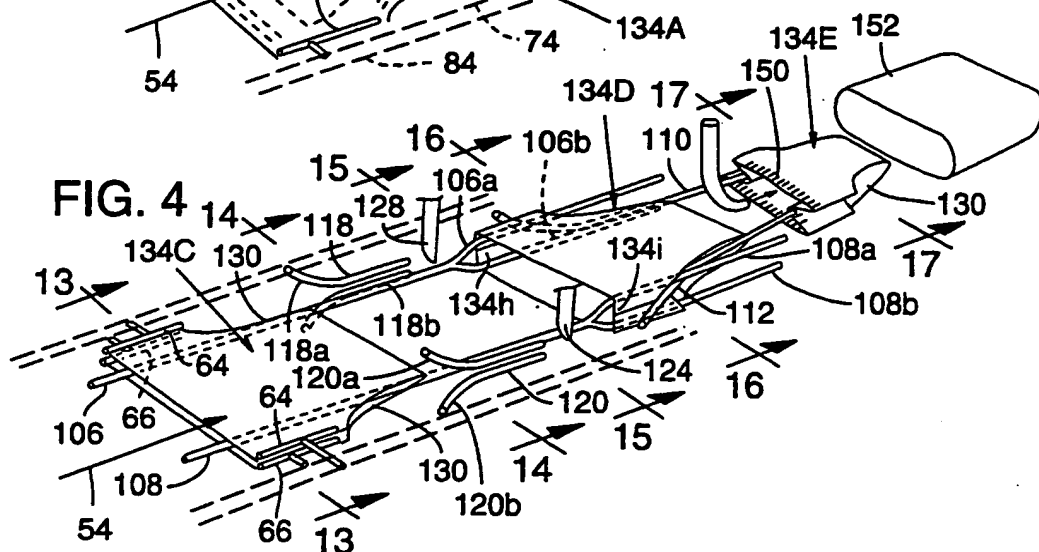
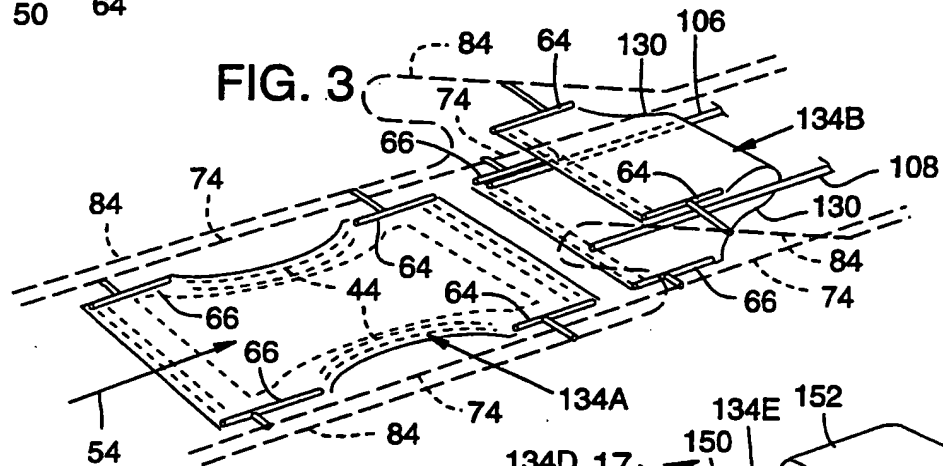
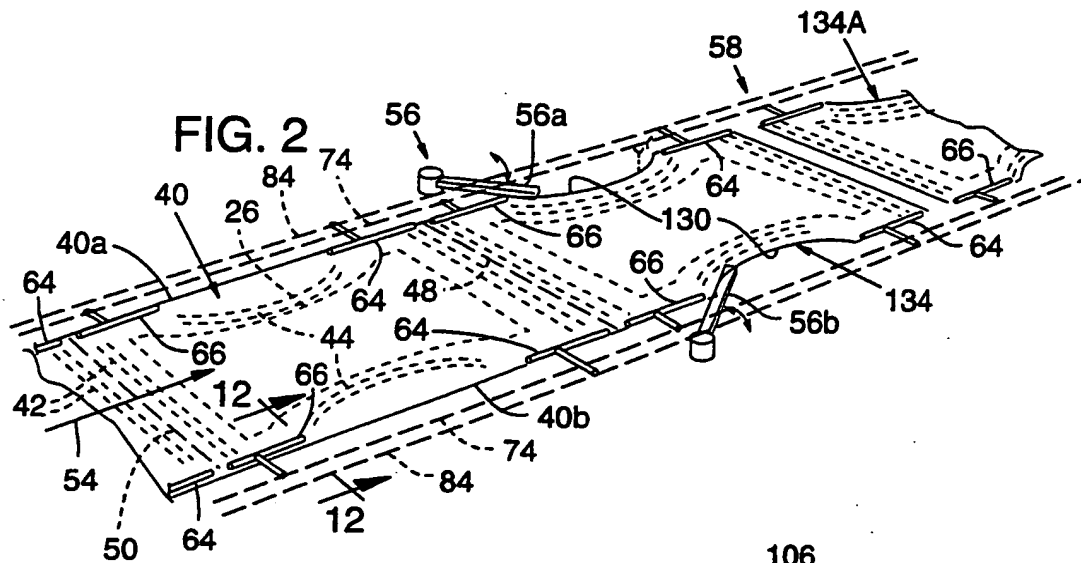
39. The method of claim 38 which further comprises providing an elongate holding element extending longitudinally of the path and inserting said holding element into the region of registry between the  
5 leading and trailing portions, laterally inwardly of the engaging members.

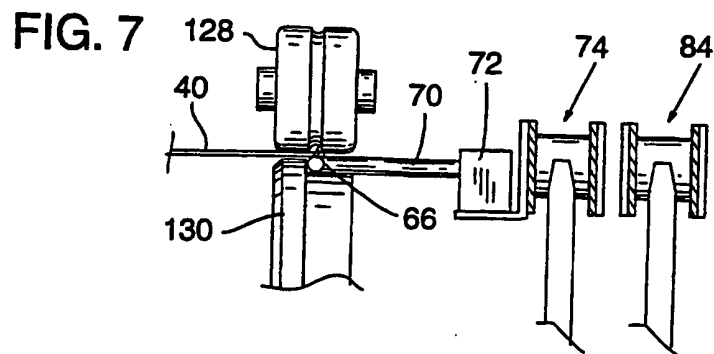
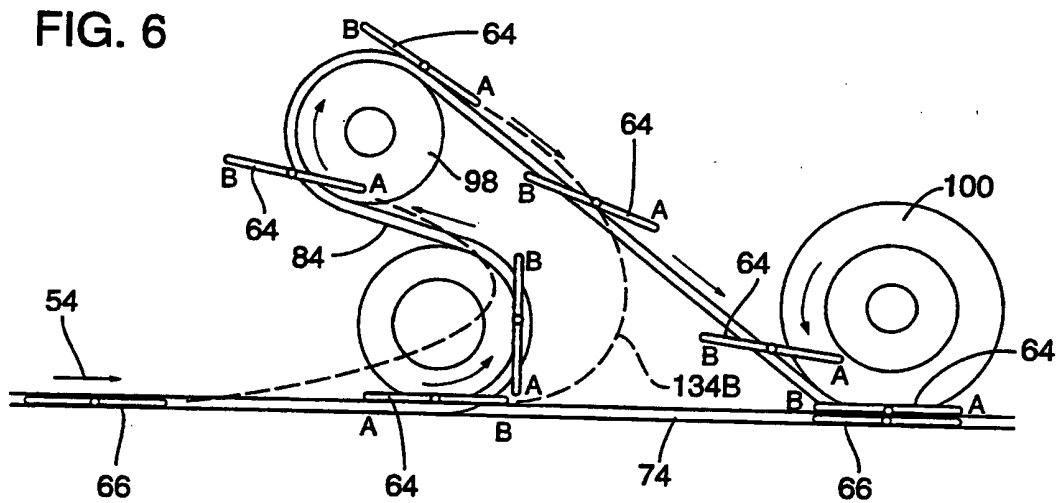
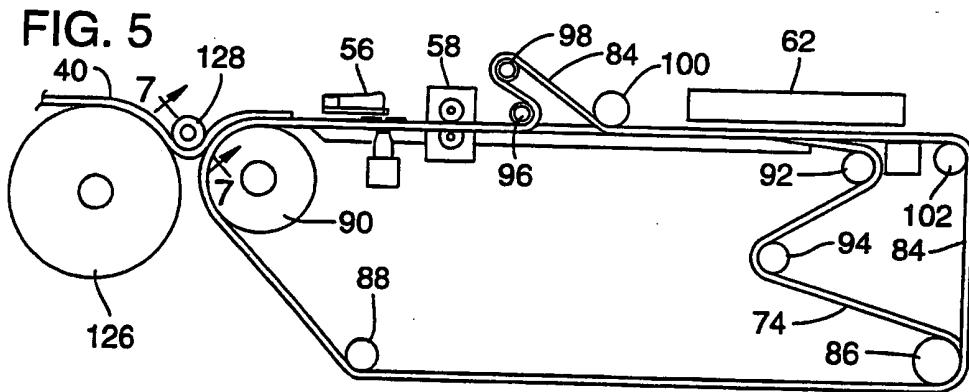
40. The method of claim 39, which further comprises the step of joining the leading and trailing end portions of the product in a region intermediate the engaging members and holding element.

41. The method of claim 40, which comprises the step of severing the product along a line intermediate the engaging members and joined region of the leading and trailing end portions.

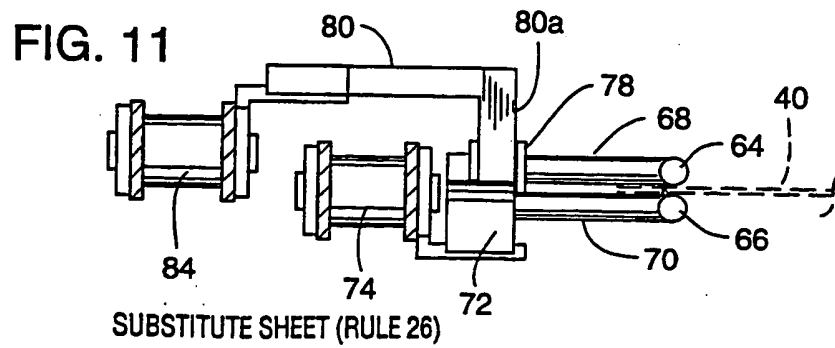
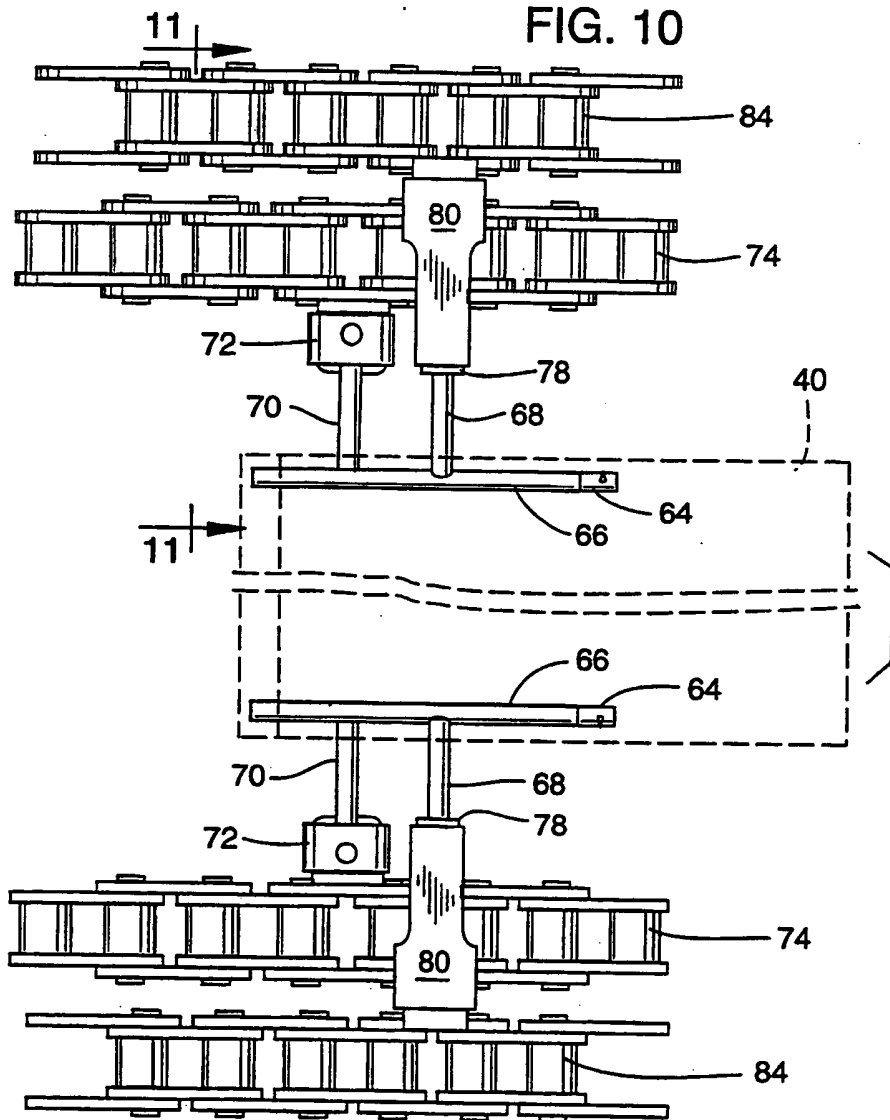
42. The method of claim 41 which further comprises the step of spreading a side region of the product adjacent the joined region of the leading and trailing portions, and tucking a central region of said  
5 spread portion laterally inwardly to provide a reverse bend folded portion for the side region of the product.

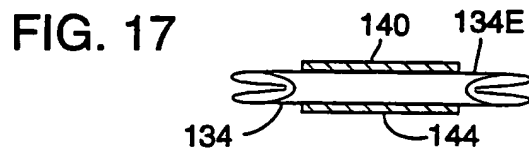
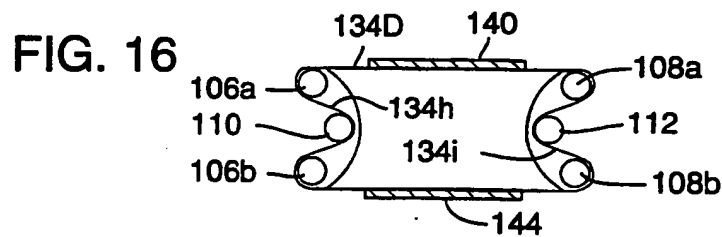
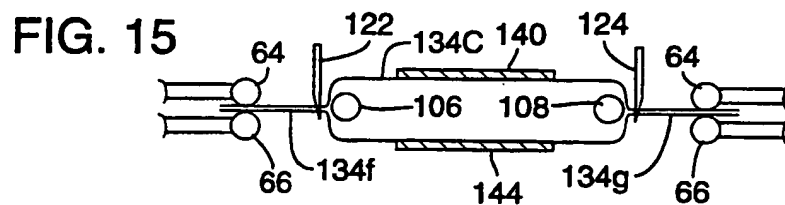
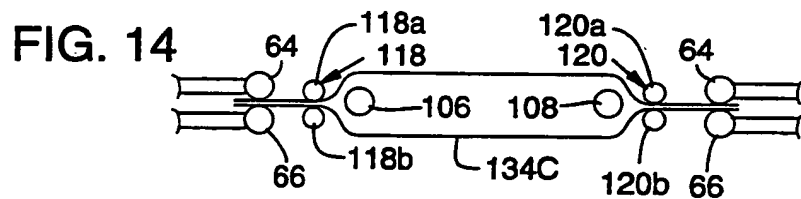
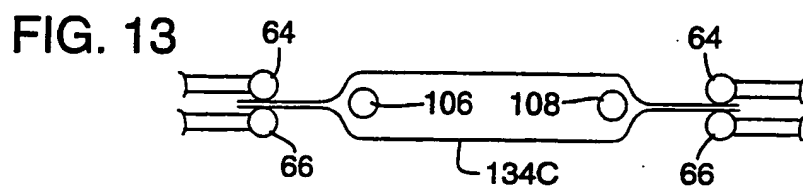
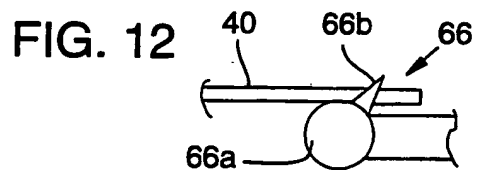












# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/05986

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A41B 13/00; B32B 31/10

US CL :156/164, 494, 496

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 156/163, 164, 229, 494, 495, 496, 538, 539; 271/226, 229

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
NONE.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y P	US, A, 5,411,618 (JOCEWICZ, JR.) 02 May 1995, see figures 1-4.	1-6, 20-24, 33-35
Y P	US, A, 5,389,173 (MERKATORIS ET AL) 14 February 1995, see figure 1 and abstract.	1-6, 20-24, 33-35
Y	US, A, 4,968,313 (SABEE) 06 November 1990, see abstract, figures 1-13, and figures 28-29.	1-6, 20-24, 33-35
Y	US, A, 3,531,347 (STULTZ, JR.) 29 September 1970, See figures 1-3.	1-6, 20-24, 33-35
Y	US, A, 2,423,294 (COLESWORTHY) 01 July 1947, see figures 1-2.	1-6, 20-24, 33-35
A	US, A, 4,284,454 (JOA) 18 August 1981.	

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

Special categories of cited documents:	
*A* document defining the general state of the art which is not considered to be part of particular relevance	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*E* earlier document published on or after the international filing date	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	*Z* document member of the same patent family

Date of the actual completion of the international search

20 JULY 1995

Date of mailing of the international search report

09AUG 1995

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